CEQA-Level Preliminary Drainage Study
for
Rite Aid Valley Center
Valley Center, California

Prepared for:

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March 31, 2017
Revised July 3, 2017
Revised February 21, 2018

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Table of Contents

Appendices

1. Introduction

This drainage report has been prepared in support of the proposed planning-level processing for the Rite Aid Valley Center project, and in conjunction with the project stormwater quality management plan (SWQMP) designs and requirements. County of San Diego development requirements call for hydrology calculations at this project stage, with an analysis of existing and proposed conditions. An increase in runoff is anticipated for the project as the impervious area will be greater in proposed conditions. Therefore, a detention routing analysis is included in this study to demonstrate that the proposed condition 100-year peak flow is below the existing condition level.

2. Project Description

The Rite Aid Valley Center project is a retail project located at the southeast corner of the intersection of Valley Center Road and Cole Grade Road in Valley Center, County of San Diego, California (see Figure 1 below for project location). The project proposes redevelopment of the property from the existing restaurant and parking lot to a Rite Aid store, parking, and a delivery access driveway. The current land use designation of commercial will remain unchanged.

Figure 1: Location Map

3. Drainage Patterns and Hydrologic Methodology

The existing site is partially built upon with a restaurant and parking lot occupying the western half of the site. The remaining eastern area is an open graded lot, and there is no runon from the adjacent properties or streets. Runoff from the 1.2 acre project's onsite drainage sheet flows in a southwesterly direction and discharges to the curb and gutter along Cole Grade Road. There is no other drainage infrastructure onsite.

In proposed conditions, site drainage patterns will remain generally unchanged, flowing in a southwesterly direction towards Cole Grade Road. Runoff from the building, onsite parking lot, and landscaping will drain to a biofiltration basin along Cole Grade Road. High flows will pass through the biofiltration basin's overflow riser structure and drain to an underground detention vault. Since there is no reliable infiltration and no storm drain infrastructure near the downstream end of the site, pumps are proposed to drain runoff from both the biofiltration basin and the storage vault to the curb and gutter on Cole Grade Road. The pumps are preliminarily sized to meet both HMP and flood control requirements, and flowrates are provided in the stage-discharge table within Appendix C.

Rational Method hydrologic calculations are provided for the existing and proposed conditions using San Diego County methodology. 100-year flows were calculated using the AES Rational Method software based on the design storm rainfall and estimated runoff coefficients (see Appendices A and B). The Rational Method calculations are reflected on the hydrology maps in Appendix D, with corresponding drainage boundaries, initial subareas, and discharge points illustrated.

In order to mitigate the increase in 100-year peak flow for proposed conditions, a Rational Method hydrograph and detention routing analysis was performed for the project. The 100-year, 6-hour Rational Method hydrograph was routed through the biofiltration basin and underground detention vault using SWMM. The detention routing analysis is provided in Appendix C.

For this preliminary-level study, separate hydraulic calculations for storm drain sizing are not provided. It is anticipated that further refinement of the storm drain design will occur at the final construction drawing stage of the project, along with a more detailed analysis of the attenuation provided in the underground detention vault. In addition, discharge of onsite runoff into the curb and gutter will be designed per public road standards and calculations will be provided in final engineering.

4. Summary and Conclusions

The proposed Rite Aid Valley Center development project, as designed, will not substantially alter the existing drainage pattern. Though flowrates increase from existing to proposed project conditions, the proposed underground detention will detain peak flow rates to below existing levels, and therefore runoff from the proposed project will not exceed the capacity of the downstream storm drain system. A summary of existing and proposed conditions runoff is provided in Table 1 and Table 2.

Table 1: Existing Condition Runoff Table

Location	Area (ac)	Runoff Coeff. C	Tc (min)	Intenisty I (in/hr)	Q_{100} (cfs)
Project Discharge Point (POC-1)	1.2	0.50	2.9	9.75	4.0

Table 2: Proposed Condition Runoff Table

Location	Area (ac)	Runoff Coeff. C	Tc (min)	Intenisty I (in/hr)	$Q_{100, without\ detention}$ (cfs)	$Q_{100, with\ detention}$ (cfs)
Project Discharge Point (POC-1)	1.2	0.80	4.9	9.75	9.4	4.0

Additional impacts to a stream or river are not anticipated for this project. This is because there are no streams or rivers running through or immediately around the project site, and onsite runoff is detained to meet hydromodification and flood control criteria. Therefore, the project will not result in any on- or off-site erosion, siltation, or flooding.

Based on FEMA and County of San Diego floodplain maps, the project site is approximately 750-feet from the nearest 100-year flood hazard area boundary. Thus, it is clear that no housing is proposed within the 100-year flood hazard area, and no structures are proposed within the 100-year flood hazard area which would impede or redirect flood flows. Furthermore, the project will not expose people or structures to a significant risk of loss, injury, or death involving flooding as a result of the failure of a levee or dam, as there are no levees or dams impacted by the project site.

5. DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE COUNTY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

____

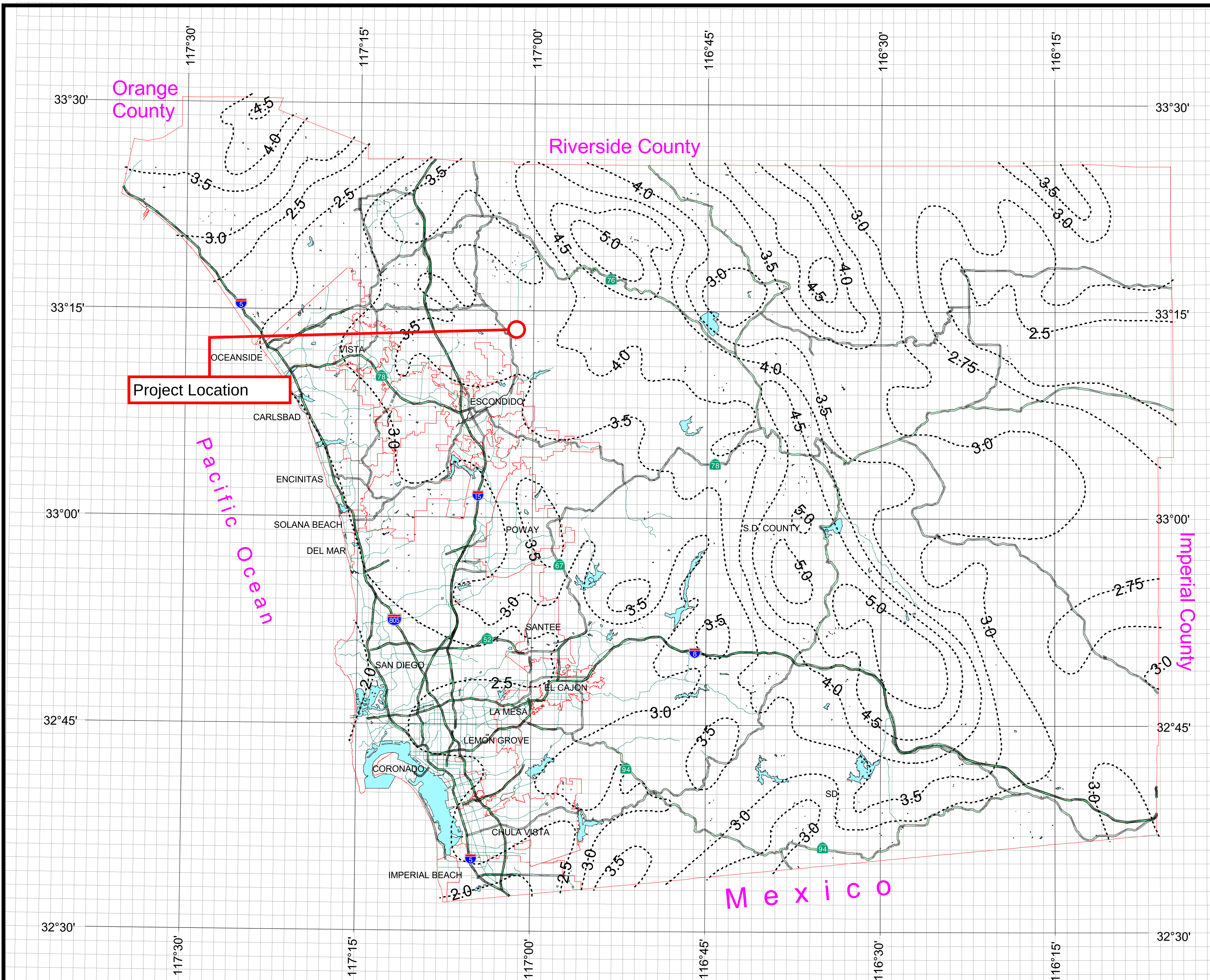
TORY R. WALKER, R.C.E. 45005 DATE

Appendix A

San Diego County Figures and Nomographs

County of San Diego Hydrology Manual

Rainfall Isopluvials



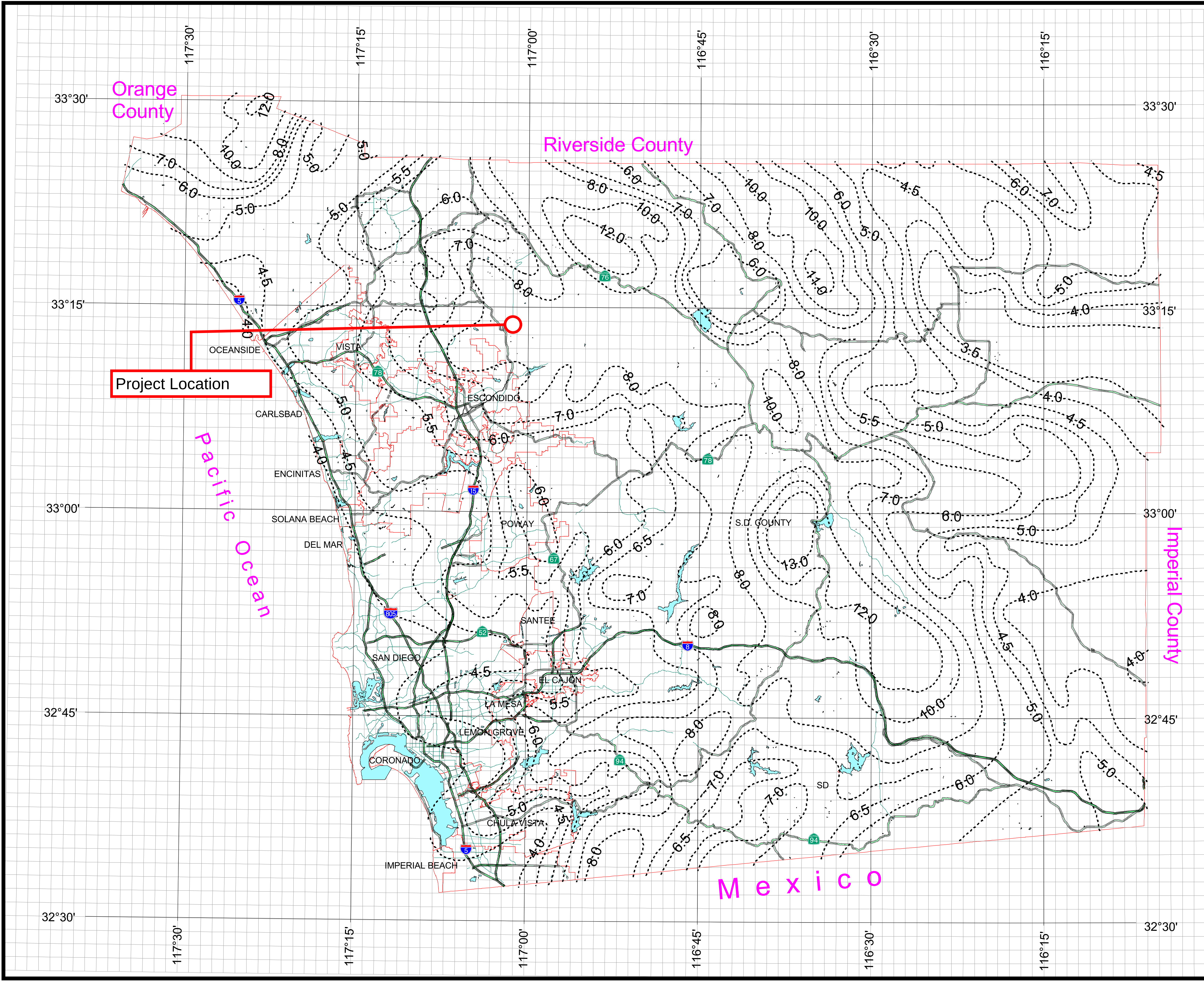
100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

County of San Diego Hydrology Manual

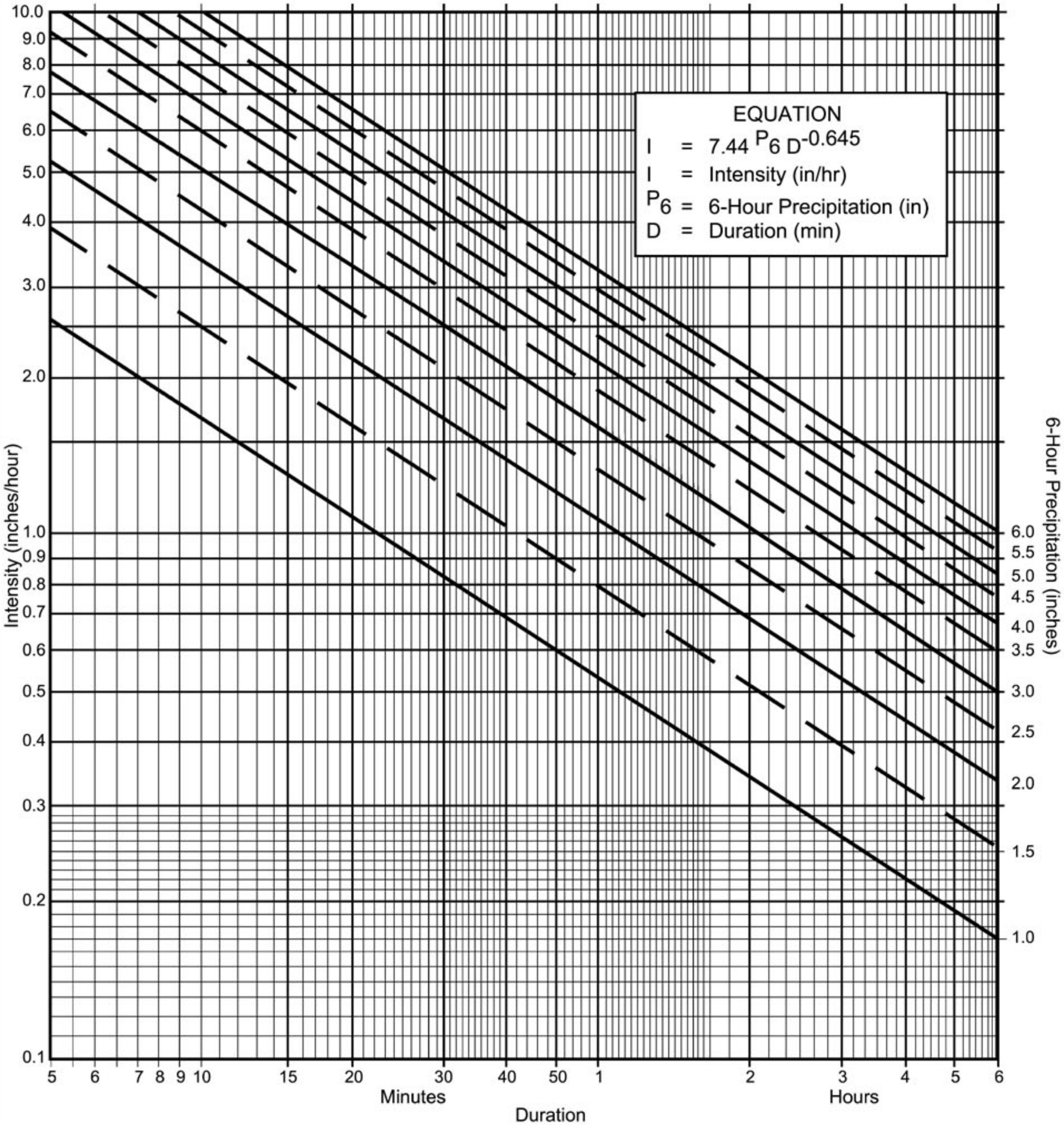
Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours



DPW GIS Department of Public Works Geographic Information Services

SanGIS We Have San Diego Covered!



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100- year

(b) P_6 = 3.7 in., P_{24} = 8.2 in , $\frac{P_6}{P_{24}}$ = 45 %(2)

(c) Adjusted P_6(2) = N/A in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

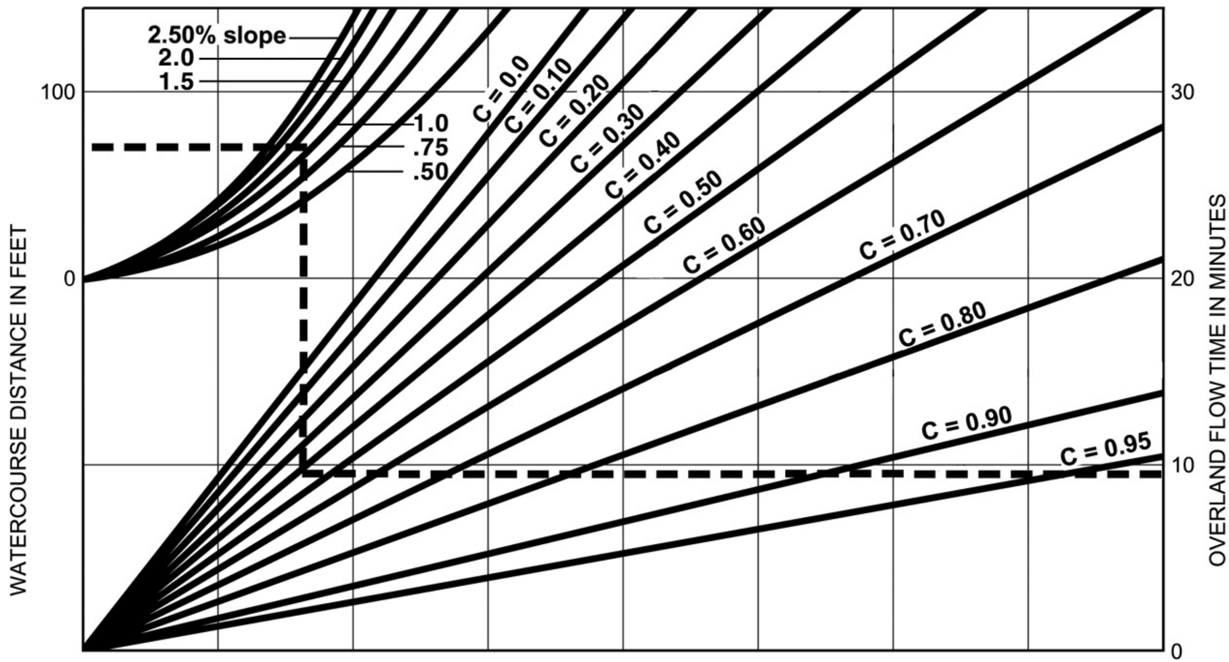
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1\text{-}C)\sqrt{D}}{\sqrt[3]{s}}$$

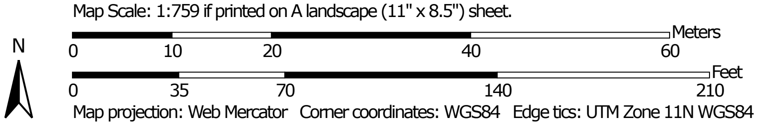
SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

3-3

Rational Formula - Overland Time of Flow Nomograph

Map Scale: 1:759 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
FaC2	Fallbrook sandy loam, 5 to 9 percent slopes, eroded	C	0.0	0.1%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	2.1	99.9%
Totals for Area of Interest			**2.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Value selected for Cp

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Appendix B

Rational Method Calculations (Q100)

RATIONAL METHOD HYDROLOGY DATA SHEET

Project Name: Rite Aid
Date: 2/19/2018
Description: Existing Conditions (CEQA Drainage Study)
Drawing Path:

Job#: 097-02

U/S NODE	D/S NODE	AES CODE	U/S ELEV	D/S ELEV	LENGTH (feet)	LAND USE	Imperv. Area (sf)	%Imperv	C_p coeff.	C* coeff.	AREA (acres)
100.0	101.0	2	1357.0	1354.5	53	N/A	0	0.0%	0.30	0.30	0.07
101.0	102.0	5	1354.5	1347.0	290	N/A	1454	4.8%	0.30	0.33	0.69
102.0	102.0	1									
200.0	201.0	2	1353.0	1351.4	51	N/A	1335	100.0%	0.30	0.90	0.03
201.0	202.0	5	1351.4	1347.7	159	N/A	7876	94.0%	0.30	0.86	0.19
300.0	301.0	8				N/A	7107	68.1%	0.30	0.71	0.24
202.0	102.0	1									
							Total Area Weighted C:			0.50	

*Note: C = 0.90 x (%Impervious) + C_p x (1 - %Impervious)
where C_p is the Pervious Coefficient Runoff Value for the soil type shown in Table 3-1 (2003 San Diego County Hydrology Manual).

RATIONAL METHOD HYDROLOGY DATA SHEET

Project Name: Rite Aid
Date: 2/19/2018
Description: Proposed Conditions (CEQA Drainage Study)
Drawing Path:

Job#: 097-02

U/S NODE	D/S NODE	AES CODE	U/S ELEV	D/S ELEV	LENGTH (feet)	LAND USE	Imperv. Area (sf)	%Imperv	C_{perv} coeff.	C coeff.	AREA (acres)
100.0	101.0	2	57.5	54.3	64	N/A	1200	94.5%	0.30	0.87	0.03
101.0	102.0	6	54.3	47.1	403	N/A	19641	95.7%	0.30	0.87	0.47
102.0	103.0	4	46.9	46.8	40	N/A					
103.0	104.0	1				N/A					
200.0	201.0	2	56.8	54.5	42	N/A	1116	82.4%	0.30	0.79	0.03
201.0	202.0	9	54.5	50.3	211	N/A	17347	80.8%	0.30	0.78	0.49
202.0	104.0	1				N/A					
300.0	104.0	2	53.4	49.4	63	N/A	2436	96.6%	0.30	0.88	0.06
400.0	104.0	8				N/A	2190	94.2%	0.30	0.87	0.05
500.0	104.0	8				N/A	305	8.4%	0.30	0.35	0.08
104.0	104.0	1				N/A					
104.0	105.0	4	45.0	44.0	13	N/A					
105.0	106.0	4	44.0	43.0	30	N/A					
*Note: C = 0.90 x (%Impervious) + C_p x (1 - %Impervious) where C_p is the Pervious Coefficient Runoff Value for the soil type shown in Table 3-1 (2003 San Diego County Hydrology Manual).							Total Area Weighted C:			0.80	

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* RITE AID EXISTING CONDITION                                              *
* 100-YEAR                                                                 *
* JOB #097-02                                                              *
 **************************************************************************

  FILE NAME: RAEX100.DAT
  TIME/DATE OF STUDY: 18:39 02/16/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    53.00
  UPSTREAM ELEVATION(FEET) =   1357.00
  DOWNSTREAM ELEVATION(FEET) =   1354.50
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.251
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.441
```

```
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1354.50  DOWNSTREAM(FEET) =   1347.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   290.00   CHANNEL SLOPE =  0.0259
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.342
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.39
  AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   3.49
  Tc(MIN.) =    9.74
  SUBAREA AREA(ACRES) =     0.69       SUBAREA RUNOFF(CFS) =    1.44
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.327
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       1.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   1.57
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     343.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.74
  RAINFALL INTENSITY(INCH/HR) =   6.34
  TOTAL STREAM AREA(ACRES) =     0.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.58

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    51.00
  UPSTREAM ELEVATION(FEET) =   1353.00
  DOWNSTREAM ELEVATION(FEET) =   1351.40
  ELEVATION DIFFERENCE(FEET) =      1.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.756
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1351.40  DOWNSTREAM(FEET) =   1347.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   159.00   CHANNEL SLOPE =  0.0233
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.06
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.42
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   1.09
  Tc(MIN.) =    2.85
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    1.59
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.865
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       1.86

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.18   FLOW VELOCITY(FEET/SEC.) =   2.86
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     210.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7843
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    1.66
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       3.52
  TC(MIN.) =    2.85

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    102.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.85
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.46
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.52

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)      (MIN.)   (INCH/HOUR)    (ACRE)
     1         1.58     9.74        6.342          0.76
     2         3.52     2.85        9.749          0.46

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
```

```
     1        3.98     2.85       9.749
     2        3.87     9.74       6.342

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.98   Tc(MIN.) =    2.85
  TOTAL AREA(ACRES) =        1.2
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     343.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      2.85
  PEAK FLOW RATE(CFS)   =       3.98
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1532

                           Analysis prepared by:





 ************************** DESCRIPTION OF STUDY **************************
* RITE AID PROPOSED CONDITION                                              *
* 100-YR                                                                   *
* JOB #097-02                                                              *
 **************************************************************************

  FILE NAME: RAPR100.DAT
  TIME/DATE OF STUDY: 11:05 02/20/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================= ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  1.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    64.00
  UPSTREAM ELEVATION(FEET) =     57.50
  DOWNSTREAM ELEVATION(FEET) =     54.30
  ELEVATION DIFFERENCE(FEET) =      3.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.937
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
```

```
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   54.30  DOWNSTREAM ELEVATION(FEET) =   47.10
  STREET LENGTH(FEET) =   403.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.25
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.41
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.72
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.85
  STREET FLOW TRAVEL TIME(MIN.) =   2.46   Tc(MIN.) =    4.40
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.47      SUBAREA RUNOFF(CFS) =    3.99
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       4.24

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  11.45
  FLOW VELOCITY(FEET/SEC.) =  3.11   DEPTH*VELOCITY(FT*FT/SEC.) =   1.14
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     467.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    46.90  DOWNSTREAM(FEET) =    46.80
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   1.69
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =        4.24
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    4.80
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     507.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
```

```
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    4.80
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.24

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    42.00
  UPSTREAM ELEVATION(FEET) =     56.80
  DOWNSTREAM ELEVATION(FEET) =     54.50
  ELEVATION DIFFERENCE(FEET) =      2.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.052
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
==========================================================================
  UPSTREAM NODE ELEVATION(FEET) =     54.50
  DOWNSTREAM NODE ELEVATION(FEET) =     50.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   211.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.130
  PAVEMENT LIP(FEET) =  0.031   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.09
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.24
  AVERAGE FLOW DEPTH(FEET) =   0.22   FLOOD WIDTH(FEET) =    8.98
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.09   Tc(MIN.) =    3.14
  SUBAREA AREA(ACRES) =    0.49       SUBAREA RUNOFF(CFS) =    3.73
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.781
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       3.96

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOOD WIDTH(FEET) =   13.57
  FLOW VELOCITY(FEET/SEC.) =   3.40   DEPTH*VELOCITY(FT*FT/SEC) =   0.91
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     253.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  3
```

```
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    3.14
 RAINFALL INTENSITY(INCH/HR) =   9.75
 TOTAL STREAM AREA(ACRES) =     0.52
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.96

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8800
 S.C.S. CURVE NUMBER (AMC II) =   0
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    63.00
 UPSTREAM ELEVATION(FEET) =     53.40
 DOWNSTREAM ELEVATION(FEET) =     49.40
 ELEVATION DIFFERENCE(FEET) =      4.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.698
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.51
 TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.51

****************************************************************************
 FLOW PROCESS FROM NODE    400.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8700
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8755
 SUBAREA AREA(ACRES) =    0.05   SUBAREA RUNOFF(CFS) =    0.42
 TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.94
 TC(MIN.) =    1.70

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.6542
 SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.27
 TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       1.21
 TC(MIN.) =    1.70

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    1.70
```

```
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.21

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         4.24     4.80        9.749         0.50
     2         3.96     3.14        9.749         0.52
     3         1.21     1.70        9.749         0.19

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
     1         4.85     1.70       9.749
     2         7.94     3.14       9.749
     3         9.41     4.80       9.749

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.41   Tc(MIN.) =    4.80
  TOTAL AREA(ACRES) =        1.2
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     507.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    45.00  DOWNSTREAM(FEET) =    44.00
  FLOW LENGTH(FEET) =    13.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.97
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.41
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    4.81
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     520.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    44.00  DOWNSTREAM(FEET) =    43.00
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.98
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.41
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    4.85
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     550.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      4.85
  PEAK FLOW RATE(CFS)   =       9.41
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix C

Detention Routing Study

TECHNICAL MEMORANDUM:

Determination of 100-year Peak Flow In Pre- and Post-Developed Conditions for Rite Aid

Valley Center, CA

Prepared for:

Halferty Development Company, LLC

July 3, 2017

Revised February 21, 2018

Tory R. Walker, PE, CFM, LEED GA
R.C.E. 45005

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

TECHNICAL MEMORANDUM

TO: Halferty Development Company, LLC
Attn: Chris Peto
199 S. Los Robles Ave, Suite 840
Pasadena, CA 91101

FROM: Tory Walker, PE, CFM, LEED GA

DATE: July 3, 2017. Revised February 21, 2018.

RE: Determination of the 100-year Peak Flow in Pre- and Post-Developed Conditions for Rite Aid, Valley Center, CA.

INTRODUCTION

This report is based on the hydraulic model used in the technical memorandum *"SWMM Modeling for Hydromodification Compliance of Rite Aid, Valley Center, CA, February 21, 2018"*[1] by Tory R. Walker Engineering (TRWE). Existing and proposed 100-year, 6-hour hydrographs were generated to prove that the proposed peak flow is smaller than the existing peak flow for the project's point of compliance (POC-1).

For this drainage analysis, time of concentration values and peak flows were obtained from the project's CEQA Drainage Study. Hydrographs were generated using the "*San Diego County Hydrology Manual (SDCHM), June 2003*"[2] Rational Method Hydrograph procedure. This is the prescribed method for drainage areas less than one square mile. Hydraulic routing was performed in SWMM, as the complex routing structures discharging to the POC have already been built in SWMM for hydromodification analysis: models include LID calculations and Modified Puls routing.

EXISTING AND PROPOSED CONDITIONS

The Rite Aid project proposes to develop an existing commercial site, which is partially developed as a restaurant and parking lot, located at the southeastern corner of the intersection of Valley Center Road and Cole Grade Road in Valley Center, CA. One (1) Point of Compliance (POC-1) has been identified at the southwest corner of the project site along Cole Grade Road, which is the point at which the majority of the proposed site runoff will be discharged to the Valley Center MS4 system (see Appendix 1 for hydrology exhibits).

GENERAL HYDROLOGIC CONSIDERATIONS

SWMM was selected for the hydraulic routing because the model was already built for hydromodification analysis, and all parameters have already been defined to work under the SWMM framework. In order to change SWMM for hydromodification to SWMM for Q_{100}, changes in the rainfall data, infiltration method, and time interval were required. A general explanation of the changes and reasoning for the selection of SWMM as a hydraulic modeling tool for routing Q_{100} follows, as well as considerations for typical differences between SWMM and other models.

Rainfall

Rainfall was developed using the SDCHM, where the duration "t" is made equal to the time of concentration to maximize the peak flow. However, longer durations up to 360 minutes are used to build the complete hyetograph (precipitation distribution for the 100-year, 6-hour storm event). The 6-hour storm is distributed according to the methodology explained in the SDCHM, where the peak precipitation starts four hours after the beginning of the storm (see intensity tables in Appendix 2).

Existing and Proposed Hydrograph Determination

For existing conditions, the runoff hydrograph was calculated with a spreadsheet following the SDCHM Rational Method Hydrograph procedure (see results in Appendix 2). Each peak at each time interval is equal to $Q = C \cdot I \cdot A$ (with I corresponding to the intensity at any given time during the 6-hour storm).

For proposed conditions, runoff hydrographs are determined using the same approach as described above for existing conditions (SDCHM Rational Method Hydrograph spreadsheets were used, see results in Appendix 3). These hydrographs are then entered into the developed condition SWMM model.

LID Routing Considerations

The biofiltration basin BMP-1 and underground storage vault are responsible for handling hydromodification and Q100 requirements for POC-1. Overflow from the biofiltration basin will pass through the basin's overflow riser, which conveys flow to the underground vault. Flows will be discharged from the biofiltration basin and underground vault by a system of three pumps that will outlet to the existing curb and gutter along Cole Grade Road. The biofiltration basin contains a low flow pump, and the vault contains medium and high flow pumps. Pump flowrates are preliminary, and will be supplanted with specific pump rating curves in final engineering.

One of the main reasons for selecting SWMM to calculate the 100-year peak flow is because of the ability of SWMM to properly route runoff through a biofiltration cell. The LID routine embedded in SWMM accounts for the ponding at the surface while the water is infiltrating through the amended soil, and it accounts for the release of water through the basin's underdrain.

For the simplified version of the LID model, SWMM assumes that once the flow fills the surface pond, all peak flows coming into the LID are equal to all flows discharged out of the LID. This approach is usually appropriate for hydromodification modeling, where hourly runoff is calculated and the surface volume does not generate a significant change in the hourly discharge. However, it is only an approximation of the real discharge of the LID, because the routing process taking place at the surface level reduces the peak flow. Expected peak flow reduction is sometimes very small but it can be significant, depending on the characteristics of the surface volume and the outlet structure. In order to properly model the routing process in the biofiltration basin, Modified Puls is performed at the surface level.

Surface routing is accounted for by dividing the biofiltration basin in two portions: the LID portion, and the surface volume above the invert of the lowest surface discharge structure. For the LID portion, the flows leaving through the basin underdrain are directly routed to the POC. For the surface portion, the volume of ponding above the invert of the lowest surface discharge opening was considered as a pond, which requires an elevation vs. area table, and an elevation vs. discharge table for use with the Modified Puls Method. Modified Puls was also used for detention routing of the underground vault in SWMM.

The required stage-storage-discharge information and a detailed description of the outlet structures are provided in the HMP Study. The elevation vs. area tables, and the elevation vs. discharge tables are included in Appendix 3 of this report. Detailed explanations for obtaining those values are included in the HMP Study.

MODEL RESULTS

The results show that the proposed biofiltration basin and underground storage system reduce the proposed peak flow below existing conditions. Results are displayed in Table 1. An existing vs. proposed hydrograph comparison is illustrated in Figure 1. It is clear that the proposed BMPs not only satisfy hydromodification criteria, but also reduce the proposed peak flow to the existing level for the 100-year, 6-hour synthetic storm.

TABLE 1. SUMMARY OF PEAK FLOW RESULTS

POC	Existing Peak flow (cfs)	Proposed Undetained Peak flow (cfs)	Proposed Detained Peak flow (cfs)	Existing – Proposed Peak Flow (cfs)
1	4.0	9.4	4.0	0.0

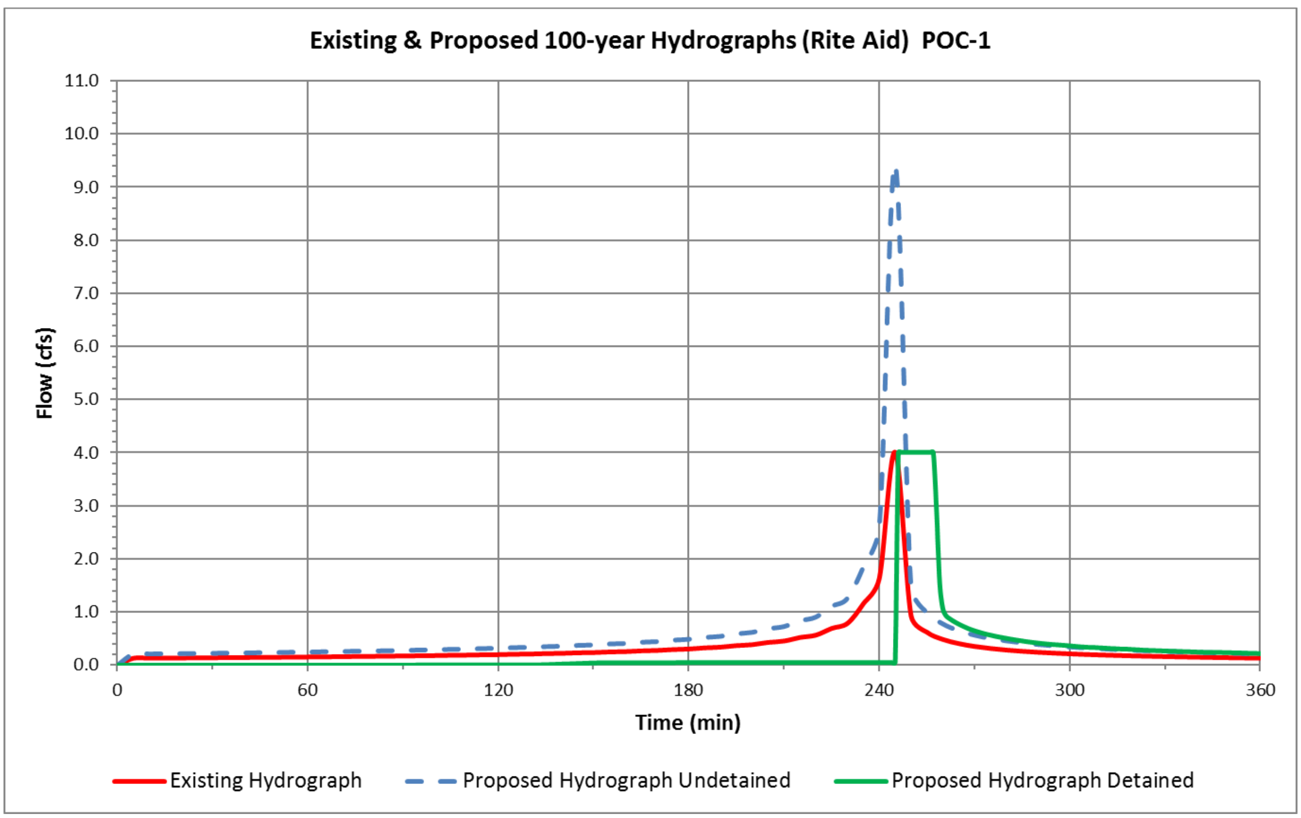


Figure 1. Hydrograph comparison for POC-1.

CONCLUSION

The design of the biofiltration basin and underground storage system with multiple functions (water quality, hydromodification, and flood mitigation) allows the reduction of the 100-year proposed peak flow below the existing level for the project's point of compliance.

REFERENCES

[1] "*Hydromodification Management Plan for Onsite Improvements at Rite Aid, Valley Center, CA, April 15, 2016, Revised March 31, 2017, Revised July 3, 2017, Revised February 21, 2018*", prepared by Tory R. Walker Engineering.

[2] "*San Diego County Hydrology Manual, June 2003".* Available at: http://www.sdcounty.ca.gov/dpw/floodcontrol/hydrologymanual.html

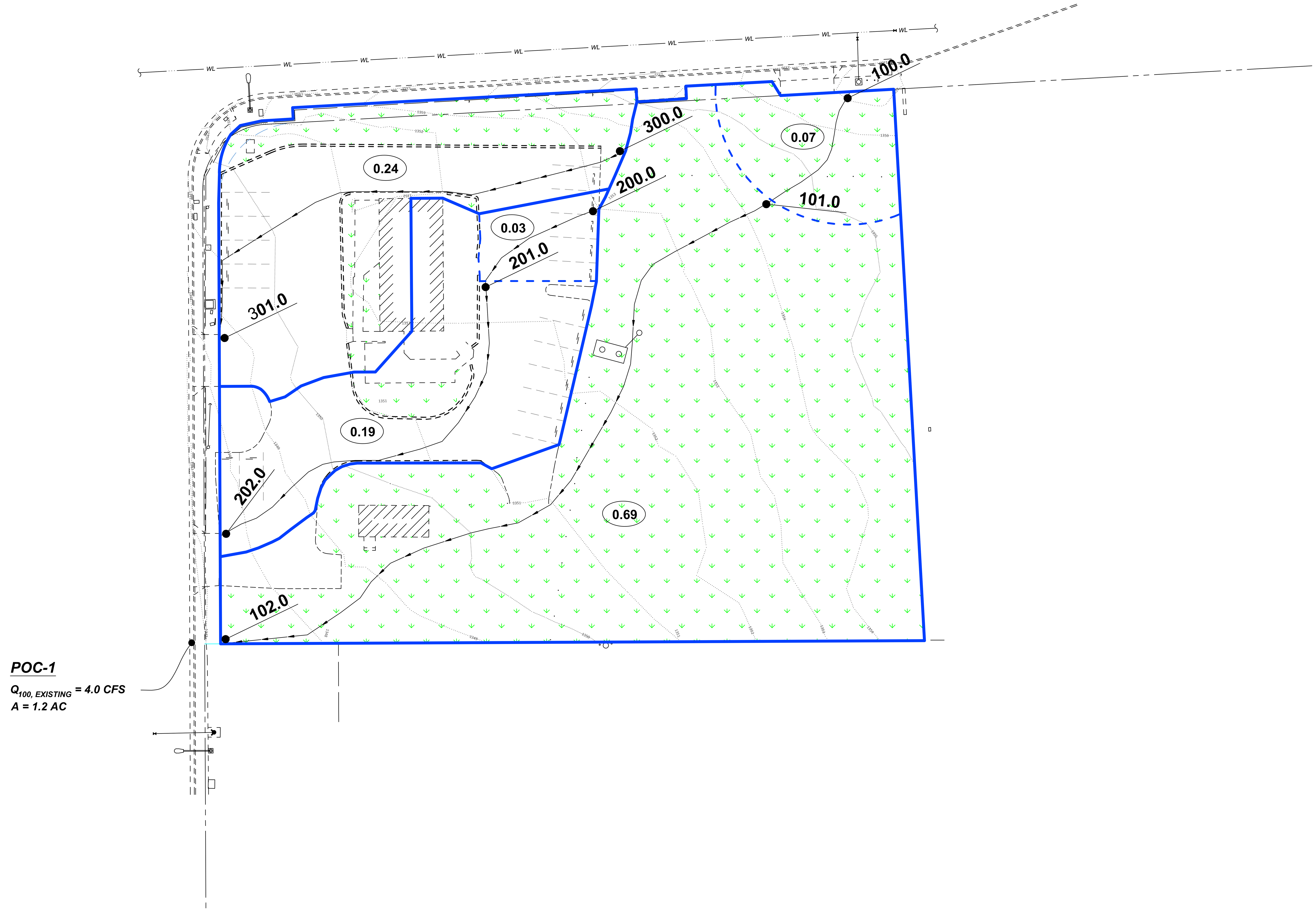
[3] "*Handbook of Hydrology*". David R. Maidment, Editor in Chief. 1992, McGraw Hill.

APPENDIX LIST

Appendix 1: Existing and Proposed Maps
Appendix 2: Precipitation and Rational Method Hydrograph Data
Appendix 3: Elevation vs. Area and Elevation vs. Discharge Curves
Appendix 4: SWMM Model Input
Appendix 5: SWMM Model Results

Appendix 1:

Existing and Proposed Maps



LEGEND

SUBAREA BASIN BOUNDARY

INITIAL AREA BOUNDARY

FLOW DIRECTION

100.0 RATIONAL METHOD NODE

0.08 AREA (AC)

EXISTING PERVIOUS AREA

610 EXISTING CONTOUR

NOTE:
EXISTING PERVIOUS AREAS AS SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREA WITHIN DRAINAGE BOUNDARIES ASSUMED IMPERVIOUS.

N W E S

0 20 40 Feet

SCALE: 1" = 20'

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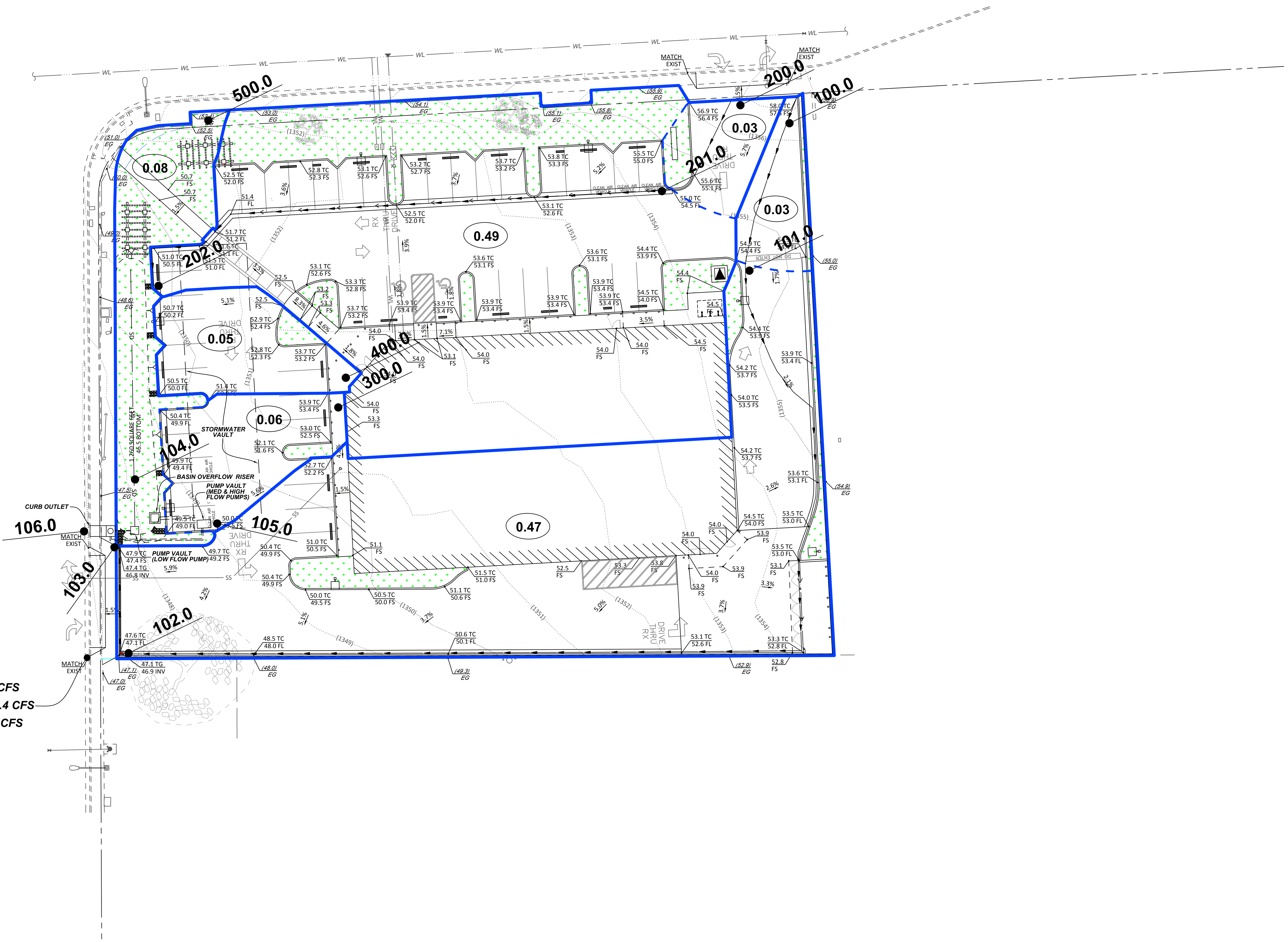
RITE AID
EXISTING CONDITION HYDROLOGY MAP



LEGEND

- SUBAREA BASIN BOUNDARY
- INITIAL AREA BOUNDARY
- FLOW DIRECTION
- 100.0 RATIONAL METHOD NODE
- 0.08 AREA (AC)
- PROPOSED PERVIOUS AREA
- 610 PROPOSED CONTOUR/SURFACE
- 610 EXISTING CONTOUR

NOTE:
PROPOSED PERVIOUS AREAS AS SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREA WITHIN DRAINAGE BOUNDARIES ASSUMED IMPERVIOUS.

POC-1

$Q_{100,\ EXISTING}$ = 4.0 CFS
$Q_{100,\ UNDETAINED}$ = 9.4 CFS
$Q_{100,\ DETAINED}$ = 4.0 CFS
A = 1.2 AC

N S E W

0 20 40 Feet

SCALE: 1" = 20'

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RITE AID
PROPOSED CONDITION HYDROLOGY MAP

X:\Projects\2097 (Halferty Development Company)\02 (Rite Aid Valley Center)\04 ACAD\hydrology-map-prop_097-02.dwg, 2/21/2018 9:05:28 PM

Appendix 2:

Precipitation and Rational Method Hydrograph Data

Rational Method Hydrograph Calculations
Existing Conditions
Rite Aid

		Q_{100}=	4.0	cfs				
		Tc=	5	min	C=	0.5		
#=	72	$P_{100,6}$=	3.7	in	A=	1.2	acres	
		(7.44*P6*D^-.645)	(I*D/60)	(V1-V0)	(ΔV/ΔT)	(Q=ciA)		(Re-ordered)
#	**D (MIN)**	**I (IN/HR)**	**VOL (IN)**	**ΔVOL (IN)**	**I (INCR) (IN/HR)**	**Q (CFS)**	**VOL (CF)**	**ORDINATE SUM=**
0	0	0.00	0.00	0.81	9.75	4.00	1200	
1	5	9.75	0.81	0.23	2.72	1.63	490	0.13
2	10	6.23	1.04	0.16	1.93	1.16	347	0.13
3	15	4.80	1.20	0.13	1.55	0.93	279	0.14
4	20	3.99	1.33	0.11	1.31	0.79	237	0.14
5	25	3.45	1.44	0.10	1.15	0.69	208	0.14
6	30	3.07	1.53	0.09	1.04	0.62	186	0.14
7	35	2.78	1.62	0.08	0.94	0.57	170	0.14
8	40	2.55	1.70	0.07	0.87	0.52	157	0.15
9	45	2.36	1.77	0.07	0.81	0.49	146	0.15
10	50	2.21	1.84	0.06	0.76	0.46	137	0.15
11	55	2.08	1.90	0.06	0.72	0.43	129	0.15
12	60	1.96	1.96	0.06	0.68	0.41	122	0.16
13	65	1.86	2.02	0.05	0.65	0.39	116	0.16
14	70	1.78	2.07	0.05	0.62	0.37	111	0.16
15	75	1.70	2.12	0.05	0.59	0.35	106	0.17
16	80	1.63	2.17	0.05	0.57	0.34	102	0.17
17	85	1.57	2.22	0.05	0.55	0.33	98	0.17
18	90	1.51	2.27	0.04	0.53	0.32	95	0.17
19	95	1.46	2.31	0.04	0.51	0.31	92	0.18
20	100	1.41	2.35	0.04	0.49	0.30	89	0.18
21	105	1.37	2.39	0.04	0.48	0.29	86	0.19
22	110	1.33	2.43	0.04	0.46	0.28	84	0.19
23	115	1.29	2.47	0.04	0.45	0.27	81	0.20
24	120	1.26	2.51	0.04	0.44	0.26	79	0.20
25	125	1.22	2.55	0.04	0.43	0.26	77	0.21
26	130	1.19	2.58	0.03	0.42	0.25	75	0.21
27	135	1.16	2.62	0.03	0.41	0.24	73	0.22
28	140	1.14	2.65	0.03	0.40	0.24	72	0.22
29	145	1.11	2.68	0.03	0.39	0.23	70	0.23
30	150	1.09	2.72	0.03	0.38	0.23	69	0.24
31	155	1.06	2.75	0.03	0.37	0.22	67	0.25
32	160	1.04	2.78	0.03	0.37	0.22	66	0.26
33	165	1.02	2.81	0.03	0.36	0.22	65	0.27
34	170	1.00	2.84	0.03	0.35	0.21	63	0.28
35	175	0.98	2.87	0.03	0.35	0.21	62	0.30
36	180	0.97	2.90	0.03	0.34	0.20	61	0.31
37	185	0.95	2.93	0.03	0.33	0.20	60	0.33
38	190	0.93	2.96	0.03	0.33	0.20	59	0.34
39	195	0.92	2.98	0.03	0.32	0.19	58	0.37
40	200	0.90	3.01	0.03	0.32	0.19	57	0.39
41	205	0.89	3.04	0.03	0.31	0.19	56	0.43

Rational Method Hydrograph Calculations
Existing Conditions
Rite Aid

#	D (MIN)	I (IN/HR)	VOL (IN)	ΔVOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
42	210	0.87	3.06	0.03	0.31	0.18	55	0.46
43	215	0.86	3.09	0.03	0.30	0.18	55	0.52
44	220	0.85	3.11	0.02	0.30	0.18	54	0.57
45	225	0.84	3.14	0.02	0.29	0.18	53	0.69
46	230	0.83	3.16	0.02	0.29	0.17	52	0.79
47	235	0.81	3.19	0.02	0.29	0.17	52	1.16
48	240	0.80	3.21	0.02	0.28	0.17	51	1.63
49	245	0.79	3.23	0.02	0.28	0.17	50	4.00
50	250	0.78	3.26	0.02	0.28	0.17	50	0.93
51	255	0.77	3.28	0.02	0.27	0.16	49	0.62
52	260	0.76	3.30	0.02	0.27	0.16	48	0.49
53	265	0.75	3.33	0.02	0.27	0.16	48	0.41
54	270	0.74	3.35	0.02	0.26	0.16	47	0.35
55	275	0.74	3.37	0.02	0.26	0.16	47	0.32
56	280	0.73	3.39	0.02	0.26	0.15	46	0.29
57	285	0.72	3.41	0.02	0.25	0.15	46	0.26
58	290	0.71	3.43	0.02	0.25	0.15	45	0.24
59	295	0.70	3.45	0.02	0.25	0.15	45	0.23
60	300	0.70	3.48	0.02	0.25	0.15	44	0.22
61	305	0.69	3.50	0.02	0.24	0.15	44	0.20
62	310	0.68	3.52	0.02	0.24	0.14	43	0.19
63	315	0.67	3.54	0.02	0.24	0.14	43	0.18
64	320	0.67	3.56	0.02	0.24	0.14	42	0.18
65	325	0.66	3.58	0.02	0.23	0.14	42	0.17
66	330	0.65	3.59	0.02	0.23	0.14	42	0.16
67	335	0.65	3.61	0.02	0.23	0.14	41	0.16
68	340	0.64	3.63	0.02	0.23	0.14	41	0.15
69	345	0.64	3.65	0.02	0.22	0.13	40	0.15
70	350	0.63	3.67	0.02	0.22	0.13	40	0.14
71	355	0.62	3.69	0.02	0.22	0.13	40	0.14
72	360	0.62	3.71	0.00	0.00	0.00	0	0.13
						SUM=	**7454**	**cubic feet**
							0.17	**acre-feet**

Check: $V = C*A*P_6$

V= 0.19 acre-feet

OK

Rational Method Hydrograph Calculations
Proposed Conditions
Rite Aid

		Q_{100}=	9.41	cfs				
		Tc=	5	min	C=	0.8		
#=	72	$P_{100,6}$=	3.7	in	A=	1.2	acres	
		*(7.44*P6*D^-.645)*	*(I*D/60)*	*(V1-V0)*	*(ΔV/ΔT)*	*(Q=ciA)*		*(Re-ordered)*
	D	**I**	**VOL**	**ΔVOL**	**I (INCR)**	**Q**	**VOL**	**ORDINATE**
#	**(MIN)**	**(IN/HR)**	**(IN)**	**(IN)**	**(IN/HR)**	**(CFS)**	**(CF)**	**SUM=**
0	0	0.00	0.00	0.81	9.75	9.41	2823	
1	5	9.75	0.81	0.23	2.72	2.61	783	0.21
2	10	6.23	1.04	0.16	1.93	1.85	556	0.21
3	15	4.80	1.20	0.13	1.55	1.49	446	0.22
4	20	3.99	1.33	0.11	1.31	1.26	379	0.22
5	25	3.45	1.44	0.10	1.15	1.11	332	0.22
6	30	3.07	1.53	0.09	1.04	0.99	298	0.23
7	35	2.78	1.62	0.08	0.94	0.91	272	0.23
8	40	2.55	1.70	0.07	0.87	0.84	251	0.23
9	45	2.36	1.77	0.07	0.81	0.78	233	0.24
10	50	2.21	1.84	0.06	0.76	0.73	219	0.24
11	55	2.08	1.90	0.06	0.72	0.69	206	0.25
12	60	1.96	1.96	0.06	0.68	0.65	196	0.25
13	65	1.86	2.02	0.05	0.65	0.62	186	0.26
14	70	1.78	2.07	0.05	0.62	0.59	178	0.26
15	75	1.70	2.12	0.05	0.59	0.57	170	0.26
16	80	1.63	2.17	0.05	0.57	0.54	163	0.27
17	85	1.57	2.22	0.05	0.55	0.52	157	0.28
18	90	1.51	2.27	0.04	0.53	0.51	152	0.28
19	95	1.46	2.31	0.04	0.51	0.49	147	0.29
20	100	1.41	2.35	0.04	0.49	0.47	142	0.29
21	105	1.37	2.39	0.04	0.48	0.46	138	0.30
22	110	1.33	2.43	0.04	0.46	0.45	134	0.31
23	115	1.29	2.47	0.04	0.45	0.43	130	0.32
24	120	1.26	2.51	0.04	0.44	0.42	127	0.32
25	125	1.22	2.55	0.04	0.43	0.41	123	0.33
26	130	1.19	2.58	0.03	0.42	0.40	120	0.34
27	135	1.16	2.62	0.03	0.41	0.39	118	0.35
28	140	1.14	2.65	0.03	0.40	0.38	115	0.36
29	145	1.11	2.68	0.03	0.39	0.37	112	0.37
30	150	1.09	2.72	0.03	0.38	0.37	110	0.38
31	155	1.06	2.75	0.03	0.37	0.36	108	0.40
32	160	1.04	2.78	0.03	0.37	0.35	106	0.41
33	165	1.02	2.81	0.03	0.36	0.34	103	0.43
34	170	1.00	2.84	0.03	0.35	0.34	102	0.45
35	175	0.98	2.87	0.03	0.35	0.33	100	0.47
36	180	0.97	2.90	0.03	0.34	0.33	98	0.49
37	185	0.95	2.93	0.03	0.33	0.32	96	0.52
38	190	0.93	2.96	0.03	0.33	0.32	95	0.54
39	195	0.92	2.98	0.03	0.32	0.31	93	0.59
40	200	0.90	3.01	0.03	0.32	0.31	92	0.62
41	205	0.89	3.04	0.03	0.31	0.30	90	0.69

Rational Method Hydrograph Calculations
Proposed Conditions
Rite Aid

#	D (MIN)	I (IN/HR)	VOL (IN)	∆VOL (IN)	I (INCR) (IN/HR)	Q (CFS)	VOL (CF)	ORDINATE SUM=
42	210	0.87	3.06	0.03	0.31	0.30	89	0.73
43	215	0.86	3.09	0.03	0.30	0.29	87	0.84
44	220	0.85	3.11	0.02	0.30	0.29	86	0.91
45	225	0.84	3.14	0.02	0.29	0.28	85	1.11
46	230	0.83	3.16	0.02	0.29	0.28	84	1.26
47	235	0.81	3.19	0.02	0.29	0.28	83	1.85
48	240	0.80	3.21	0.02	0.28	0.27	82	2.61
49	245	0.79	3.23	0.02	0.28	0.27	80	9.41
50	250	0.78	3.26	0.02	0.28	0.26	79	1.49
51	255	0.77	3.28	0.02	0.27	0.26	78	0.99
52	260	0.76	3.30	0.02	0.27	0.26	77	0.78
53	265	0.75	3.33	0.02	0.27	0.26	77	0.65
54	270	0.74	3.35	0.02	0.26	0.25	76	0.57
55	275	0.74	3.37	0.02	0.26	0.25	75	0.51
56	280	0.73	3.39	0.02	0.26	0.25	74	0.46
57	285	0.72	3.41	0.02	0.25	0.24	73	0.42
58	290	0.71	3.43	0.02	0.25	0.24	72	0.39
59	295	0.70	3.45	0.02	0.25	0.24	71	0.37
60	300	0.70	3.48	0.02	0.25	0.24	71	0.34
61	305	0.69	3.50	0.02	0.24	0.23	70	0.33
62	310	0.68	3.52	0.02	0.24	0.23	69	0.31
63	315	0.67	3.54	0.02	0.24	0.23	69	0.30
64	320	0.67	3.56	0.02	0.24	0.23	68	0.28
65	325	0.66	3.58	0.02	0.23	0.22	67	0.27
66	330	0.65	3.59	0.02	0.23	0.22	67	0.26
67	335	0.65	3.61	0.02	0.23	0.22	66	0.25
68	340	0.64	3.63	0.02	0.23	0.22	65	0.24
69	345	0.64	3.65	0.02	0.22	0.22	65	0.24
70	350	0.63	3.67	0.02	0.22	0.21	64	0.23
71	355	0.62	3.69	0.02	0.22	0.21	63	0.22
72	360	0.62	3.71	0.00	0.00	0.00	0	0.22
						SUM=	**12829**	**cubic feet**
							0.29	**acre-feet**

Check: $V = C*A*P_6$

V= 0.30 acre-feet

OK

Appendix 3:

Elev. vs. Area

Elev. vs. Discharge Curves

Stage-Area for BMP-1

Depth (ft)	Area (ft^2)	Volume (ft^3)	
0.00	1260	0	**BIOFILTRATION (1)**
0.08	1280	106	
0.17	1301	213	
0.25	1321	323	
0.33	1342	434	
0.42	1363	546	
0.50	1384	661	**SURFACE OUTLET (2)**
0.58	1405	777	
0.67	1426	895	
0.75	1448	1015	
0.83	1469	1136	
0.92	1491	1260	
1.00	1513	1385	

SUB SURFACE STORAGE BMP-1

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.75	1260	441	**Amended Soil Base (0.2 voids)**
-3.50	1260	882	**Gravel Base (0.4 voids)**
Gravel & Amended Soil	**TOTAL =**	1323	(ft^3)
Surface Total	**TOTAL =**	661	(ft^3)
BMP	**TOTAL =**	**1984**	**(ft^3)**

(1): The area at this surface elevation corresponds to the area of gravel and amended soil (biofiltration layer)
(2): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

Effective Depth:	6.29 in

Stage-Area for Underground Detention Vault (UG-1)

Depth (ft)	Vault Area (sf)	Porosity	Effective Area (sf)	Volume (cf)
0.00	2625	0.95	2494	0
2.50	2625	0.95	2494	6234

Stage-Discharge for BMP-1 (Overflow Riser)

Lowest Orifice
Diameter: 0.000 inches
Quantity: 0
Invert Elevation: 0.000 ft

Lower Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft

Lower Weir
Quantity: 0
Invert Elevation: 0.00 ft
Length: 0.00 ft
H_w: 0.00 ft

Upper Orifice
Diameter: 0.00 inches
Quantity: 0
Invert Elevation: 0.000 ft

Upper Slot
Quantity: 0
Invert Elevation: 0.00 ft
Width: 0.00 ft
Height: 0.00 in
0.000 ft

Emergency Weir
Invert Elevation: 0.00 ft
Length: 12.00 ft
H_w: 0.50 ft

(H_w = height of weir crest above basin bottom)

**Head taken as total depth above the invert of the lowest discharge opening.*

h* (ft)	h/D Lowest Orifice	h/D Upper Orifice	$Q_{LOWEST\ ORIFICE}$ (cfs) Discharge Coefficient	Orifice Flow	Weir Flow	$Q_{control}$	$Q_{UPPER\ ORIFICE}$ (cfs) Discharge Coefficient	Orifice Flow	Weir Flow	$Q_{control}$	$Q_{LOWER\ SLOT}$ (cfs)	$Q_{UPPER\ SLOT}$ (cfs)	$Q_{LOWER\ WEIR}$ (cfs)	$Q_{EMERGENCY}$ (cfs)	Q_{TOTAL} (cfs)
0.000	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.000	0.000
0.083	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.963	0.963
0.167	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.779	2.779
0.250	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.205	5.205
0.333	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.168	8.168
0.417	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.630	11.630
0.500	0.000	N/A	N/A	N/A	0.000	0.000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.570	15.570

Outlet structure for Discharge of Underground Storage Vault UG_1
Discharge vs Elevation Table

Pump Summary Table			
Pump ID Number	Pump 2 (Medium Flow)	Pump X	Pump 3 (High Flow)
Flow Rate Capacity (cfs)	0.037	n/a	3.95
Pump On/Off Depth (ft)	0.00	0.00	1.83

*Note: h = head above the invert of the vault

h* (ft)	Q pump 2 (cfs)	Q pump X (cfs)	Q pump 3 (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000
0.083	0.037	n/a	0.000	0.037
0.167	0.037	n/a	0.000	0.037
0.250	0.037	n/a	0.000	0.037
0.333	0.037	n/a	0.000	0.037
0.417	0.037	n/a	0.000	0.037
0.500	0.037	n/a	0.000	0.037
0.583	0.037	n/a	0.000	0.037
0.667	0.037	n/a	0.000	0.037
0.750	0.037	n/a	0.000	0.037
0.833	0.037	n/a	0.000	0.037
0.917	0.037	n/a	0.000	0.037
1.000	0.037	n/a	0.000	0.037
1.083	0.037	n/a	0.000	0.037
1.167	0.037	n/a	0.000	0.037
1.250	0.037	n/a	0.000	0.037
1.333	0.037	n/a	0.000	0.037
1.417	0.037	n/a	0.000	0.037
1.500	0.037	n/a	0.000	0.037
1.583	0.037	n/a	0.000	0.037
1.667	0.037	n/a	0.000	0.037
1.750	0.037	n/a	0.000	0.037
1.833	0.037	n/a	0.000	0.037
1.917	0.037	n/a	3.950	3.987
2.000	0.037	n/a	3.950	3.987
2.083	0.037	n/a	3.950	3.987
2.167	0.037	n/a	3.950	3.987
2.250	0.037	n/a	3.950	3.987
2.333	0.037	n/a	3.950	3.987
2.417	0.037	n/a	3.950	3.987

Outlet structure for Discharge of Underground Storage Vault UG_1

Discharge vs Elevation Table

Pump Summary Table			
Pump ID Number	Pump 2 (Medium Flow)	Pump X	Pump 3 (High Flow)
Flow Rate Capacity (cfs)	0.037	n/a	3.95
Pump On/Off Depth (ft)	0.00	0.00	1.83

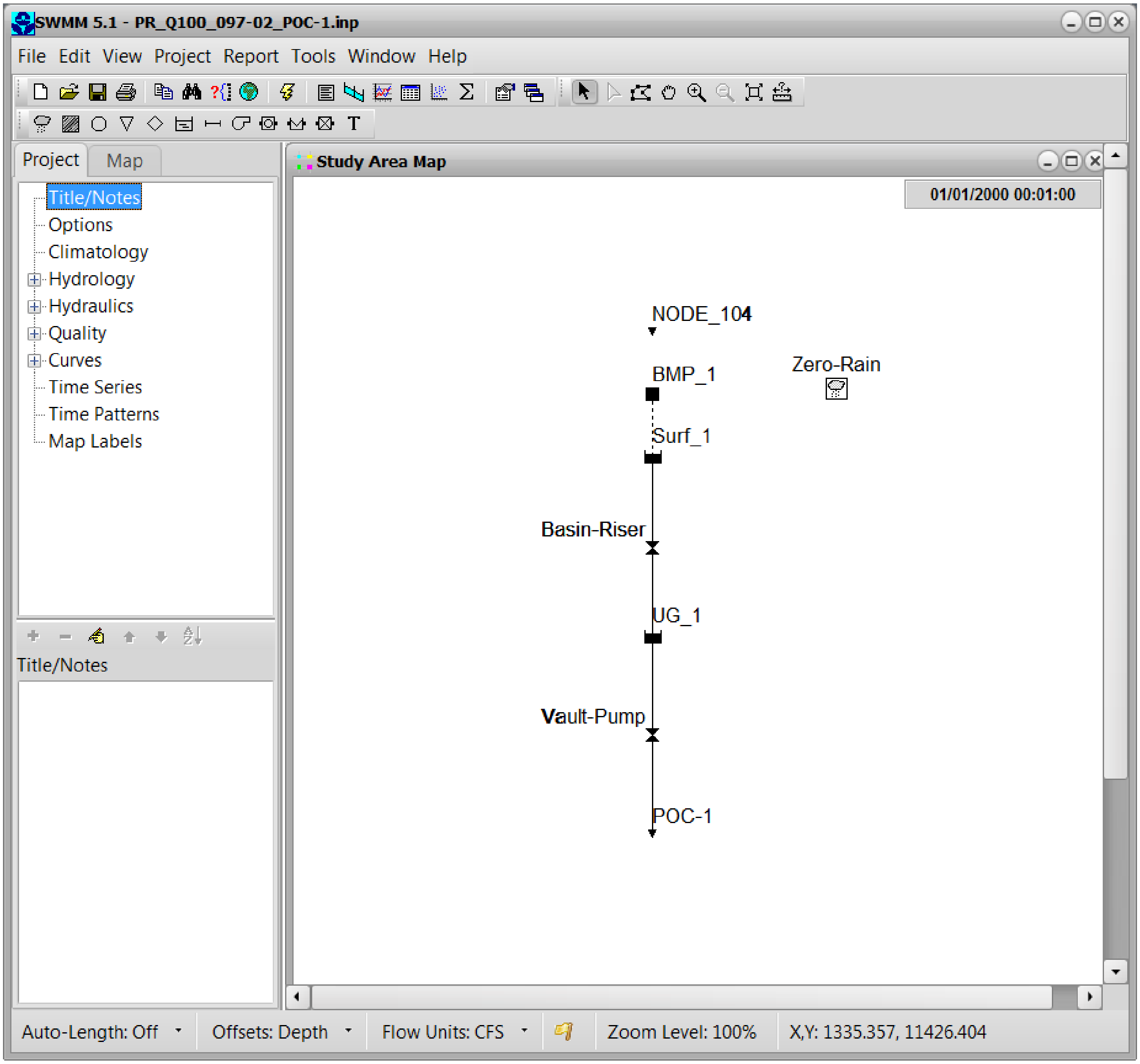
*Note: h = head above the invert of the vault

h* (ft)	Q pump 2 (cfs)	Q pump X (cfs)	Q pump 3 (cfs)	Qtot (cfs)
2.500	0.037	n/a	3.950	3.987

Appendix 4:

SWMM Model Input

PROPOSED (POC-1)



```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2000
START_TIME           00:00:00
REPORT_START_DATE    01/01/2000
REPORT_START_TIME    00:00:00
END_DATE             01/01/2000
END_TIME             12:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         0:00:10

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- ------ ------ ----------
Zero-Rain        INTENSITY 6:00     1.0      TIMESERIES ZeroRain

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
BMP_1            Zero-Rain        Surf_1           0.028926 0        10       0.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
BMP_1            0.012      0.08       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    Ksat       IMD
;;-------------- ---------- ---------- ----------
BMP_1            6          0.075      0.31

[LID_CONTROLS]
;;Name           Type/Layer Parameters
```

```
;;-------------- ---------- ----------
BMP-1            BC
BMP-1            SURFACE    6.29       0.0        0          0          5
BMP-1            SOIL       21         0.4        0.2        0.1        5          5          1.5
BMP-1            STORAGE    24         0.67       0          0
BMP-1            DRAIN      0.0661     0.5        3          6

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSat    FromImp    ToPerv     RptFile                  DrainTo
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- ------------------------ ----------------
BMP_1            BMP-1            1       1260.02    0          0          100        0          *                        POC-1

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
POC-1            0          FREE                        NO
NODE_104         0          FREE                        NO       BMP_1

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ---------- ---------------------------- -------- --------          -------- --------
Surf_1           0        0.5        0          TABULAR    BMP-1                        0        1
UG_1             0        2.5        0          TABULAR    UG_1                         0        0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type            QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- --------
Basin-Riser      Surf_1           UG_1             0          TABULAR/HEAD    BMP_1                       NO
Vault-Pump       UG_1             POC-1            0          TABULAR/HEAD    UG-1                        NO

[INFLOWS]
;;Node           Constituent      Time Series      Type     Mfactor  Sfactor  Baseline Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
NODE_104         FLOW             NODE_104         FLOW     1.0      1.0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
BMP_1            Rating     0.000      0.000
BMP_1                       0.083      0.963
BMP_1                       0.167      2.779
BMP_1                       0.250      5.205
BMP_1                       0.333      8.168
BMP_1                       0.417      11.630
BMP_1                       0.500      15.570
;
UG-1             Rating     0.000      0.000
UG-1                        0.083      0.037
UG-1                        0.167      0.037
UG-1                        0.250      0.037
UG-1                        0.333      0.037
UG-1                        0.417      0.037
UG-1                        0.500      0.037
UG-1                        0.583      0.037
UG-1                        0.667      0.037
UG-1                        0.750      0.037
UG-1                        0.833      0.037
UG-1                        0.917      0.037
UG-1                        1.000      0.037
UG-1                        1.083      0.037
UG-1                        1.167      0.037
UG-1                        1.250      0.037
UG-1                        1.333      0.037
UG-1                        1.417      0.037
UG-1                        1.500      0.037
UG-1                        1.583      0.037
UG-1                        1.667      0.037
UG-1                        1.750      0.037
```

```
UG-1                        1.833      0.037
UG-1                        1.917      3.987
UG-1                        2.000      3.987
UG-1                        2.083      3.987
UG-1                        2.167      3.987
UG-1                        2.250      3.987
UG-1                        2.333      3.987
UG-1                        2.417      3.987
UG-1                        2.500      3.987
UG-1                        2.583      3.987
UG-1                        2.667      3.987
UG-1                        2.750      3.987
UG-1                        2.833      3.987
UG-1                        2.917      3.987
UG-1                        3.000      3.987
UG-1                        3.083      3.987
UG-1                        3.167      3.987
UG-1                        3.250      3.987
UG-1                        3.333      3.987
UG-1                        3.417      3.987
UG-1                        3.500      3.987
;
BMP-1            Storage    0.00       1384
BMP-1                       0.08       1405
BMP-1                       0.17       1426
BMP-1                       0.25       1448
BMP-1                       0.33       1469
BMP-1                       0.42       1491
BMP-1                       0.50       1513
;
UG_1             Storage    0.00       2494
UG_1                        2.50       2494

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LAKE_WOHLFORD    FILE "X:\ENGR\HMP\SWMM\Rain Gages\Lake Wohlford\LakeWRain.prn"
;
;AES NODE 104
NODE_104                    0:00       0.00
NODE_104                    0:05       0.21
NODE_104                    0:10       0.21
NODE_104                    0:15       0.22
NODE_104                    0:20       0.22
NODE_104                    0:25       0.22
NODE_104                    0:30       0.23
NODE_104                    0:35       0.23
NODE_104                    0:40       0.23
NODE_104                    0:45       0.24
NODE_104                    0:50       0.24
NODE_104                    0:55       0.25
NODE_104                    1:00       0.25
NODE_104                    1:05       0.26
NODE_104                    1:10       0.26
NODE_104                    1:15       0.26
NODE_104                    1:20       0.27
NODE_104                    1:25       0.28
NODE_104                    1:30       0.28
NODE_104                    1:35       0.29
NODE_104                    1:40       0.29
NODE_104                    1:45       0.30
NODE_104                    1:50       0.31
NODE_104                    1:55       0.32
NODE_104                    2:00       0.32
NODE_104                    2:05       0.33
NODE_104                    2:10       0.34
NODE_104                    2:15       0.35
NODE_104                    2:20       0.36
```

```
NODE_104                    2:25       0.37
NODE_104                    2:30       0.38
NODE_104                    2:35       0.40
NODE_104                    2:40       0.41
NODE_104                    2:45       0.43
NODE_104                    2:50       0.45
NODE_104                    2:55       0.47
NODE_104                    3:00       0.49
NODE_104                    3:05       0.52
NODE_104                    3:10       0.54
NODE_104                    3:15       0.59
NODE_104                    3:20       0.62
NODE_104                    3:25       0.69
NODE_104                    3:30       0.73
NODE_104                    3:35       0.84
NODE_104                    3:40       0.91
NODE_104                    3:45       1.11
NODE_104                    3:50       1.26
NODE_104                    3:55       1.85
NODE_104                    4:00       2.61
NODE_104                    4:05       9.41
NODE_104                    4:10       1.49
NODE_104                    4:15       0.99
NODE_104                    4:20       0.78
NODE_104                    4:25       0.65
NODE_104                    4:30       0.57
NODE_104                    4:35       0.51
NODE_104                    4:40       0.46
NODE_104                    4:45       0.42
NODE_104                    4:50       0.39
NODE_104                    4:55       0.37
NODE_104                    5:00       0.34
NODE_104                    5:05       0.33
NODE_104                    5:10       0.31
NODE_104                    5:15       0.30
NODE_104                    5:20       0.28
NODE_104                    5:25       0.27
NODE_104                    5:30       0.26
NODE_104                    5:35       0.25
NODE_104                    5:40       0.24
NODE_104                    5:45       0.24
NODE_104                    5:50       0.23
NODE_104                    5:55       0.22
NODE_104                    6:00       0.22
;
ZeroRain                    0:00       0
ZeroRain                    6:00       0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            4409.769           3351.425
NODE_104         4409.769           9540.636
Surf_1           4409.769           7978.290
```

```
UG_1             4409.769           5766.621

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
BMP_1            4409.769           8772.291

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Zero-Rain        6702.002           8810.365
```

Appendix 5:

SWMM Model Results

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2000 00:00:00
Ending Date .............. 01/01/2000 12:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 10.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Initial LID Storage ......         0.005         2.100
Total Precipitation ......         0.000         0.000
Outfall Runon ............         0.294       121.869
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.000         0.000
Surface Runoff ...........         0.236        97.837
LID Drainage .............         0.011         4.520
Final Storage ............         0.052        21.616
Continuity Error (%) .....         0.000


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.247         0.080
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.294         0.096
External Outflow .........         0.453         0.148
Flooding Loss ............         0.000         0.000
```

Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.087	0.028
Continuity Error (%)	0.026	

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step	:	10.00 sec
Average Time Step	:	10.00 sec
Maximum Time Step	:	10.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
BMP_1	0.00	121.87	0.00	0.00	102.36	0.08	8.75	0.840

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow in	Evap Loss in	Infil Loss in	Surface Outflow in	Drain Outflow in	Initial Storage in	Final Storage in	Continuity Error %
BMP_1	BMP-1	121.87	0.00	0.00	97.84	4.52	2.10	21.62	-0.01

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
NODE_104	OUTFALL	0.00	0.00	0.00	0 00:00	0.00

Surf_1	STORAGE	0.02	0.34	0.34	0 04:07	0.34
UG_1	STORAGE	1.21	2.28	2.28	0 04:11	2.28

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
POC-1	OUTFALL	0.01	4.00	0 04:06	0.00355	0.052	0.000
NODE_104	OUTFALL	9.41	9.41	0 04:05	0.0957	0.0957	0.000
Surf_1	STORAGE	8.74	8.74	0 04:07	0.0768	0.0768	-0.040
UG_1	STORAGE	0.00	8.61	0 04:07	0	0.0769	0.100

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
Surf_1	0.023	3	0	0	0.492	68	0 04:07	8.61
UG_1	3.028	49	0	0	5.681	91	0 04:10	3.99

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
POC-1	92.11	0.17	4.00	0.052
NODE_104	49.98	0.59	9.41	0.096
System	71.04	0.77	12.09	0.148

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Basin-Riser	DUMMY	8.61	0 04:07			
Vault-Pump	DUMMY	3.99	0 04:06			

****
Conduit Surcharge Summary
****

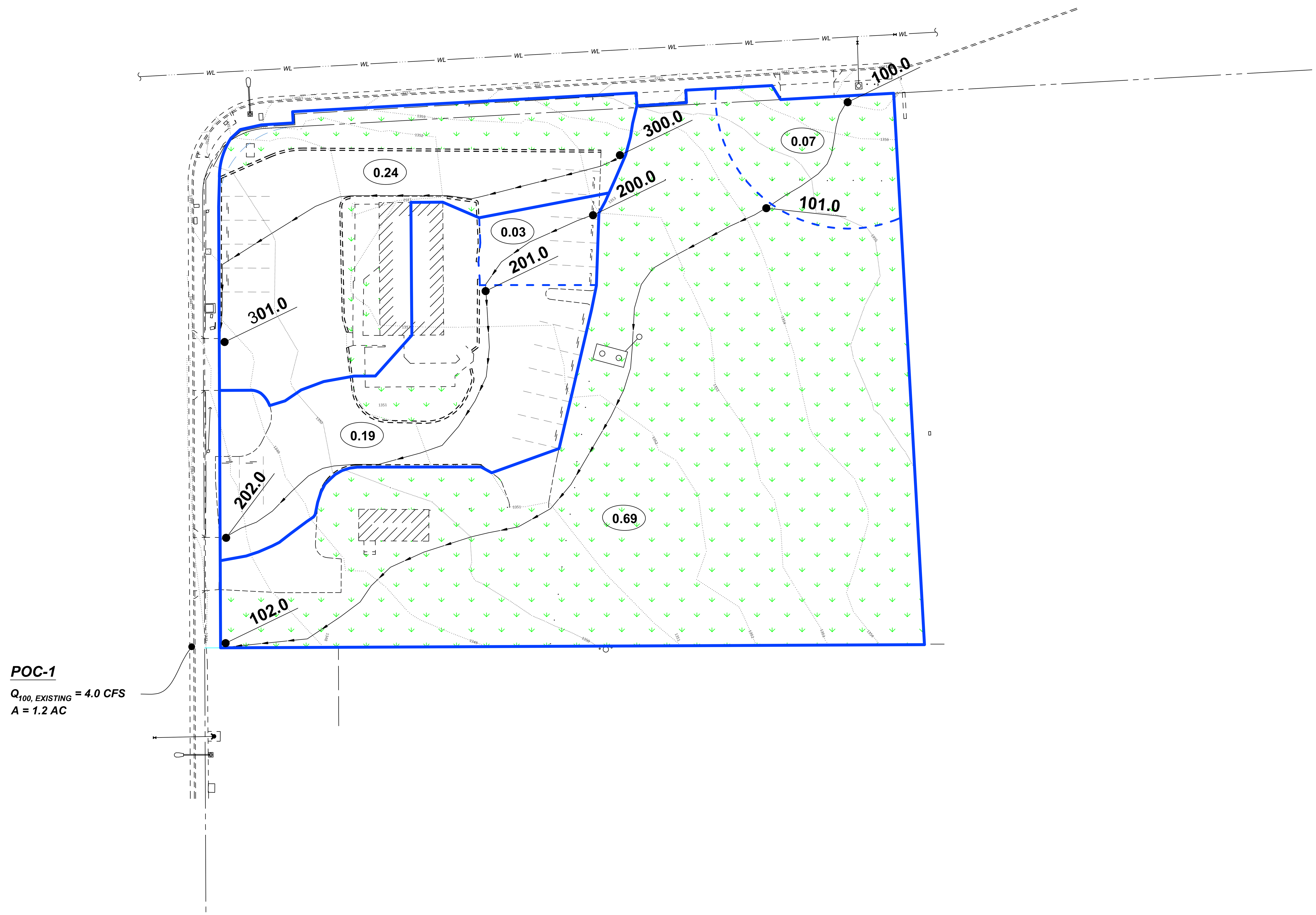
No conduits were surcharged.

Analysis begun on: Wed Feb 21 20:40:59 2018
Analysis ended on: Wed Feb 21 20:40:59 2018
Total elapsed time: < 1 sec

Appendix D

Project Maps

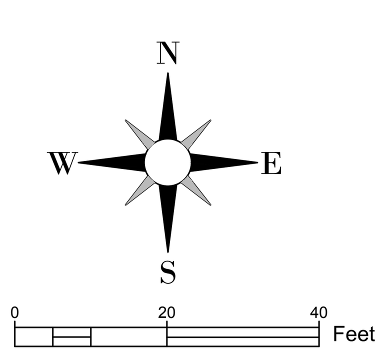
Existing Condition Hydrology Map
Developed Condition Hydrology Map
FEMA Floodplain Map



LEGEND

	SUBAREA BASIN BOUNDARY
	INITIAL AREA BOUNDARY
	FLOW DIRECTION
100.0	RATIONAL METHOD NODE
0.08	AREA (AC)
	EXISTING PERVIOUS AREA
610	EXISTING CONTOUR

NOTE:
EXISTING PERVIOUS AREAS AS SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREA WITHIN DRAINAGE BOUNDARIES ASSUMED IMPERVIOUS.



SCALE: 1" = 20'

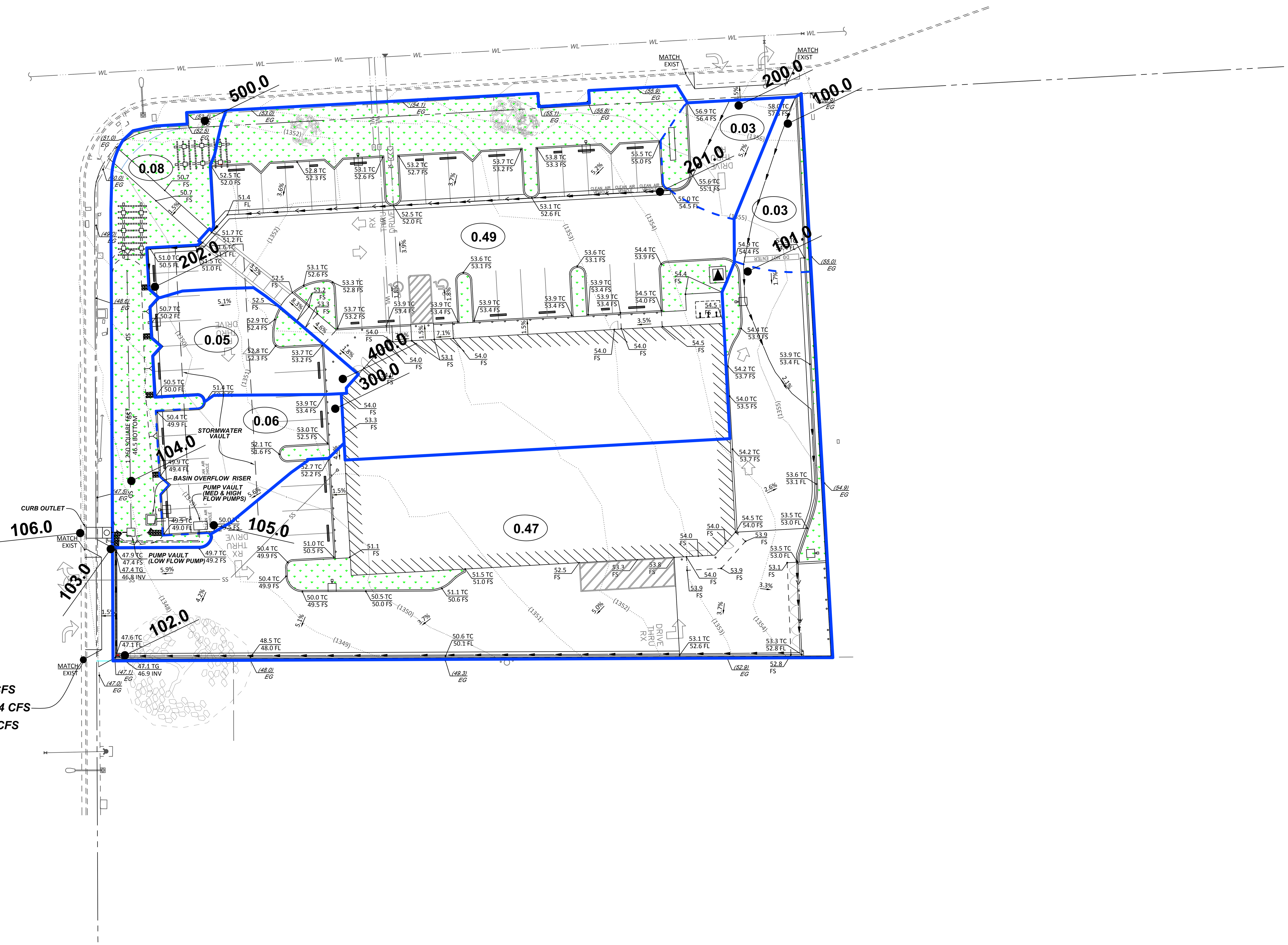
TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

RITE AID
EXISTING CONDITION HYDROLOGY MAP

X:\Projects2\097 (Halferty Development Company)\02 (Rite Aid Valley Center)\04 ACAD\hydrology-map-exist_097-02.dwg, 2/21/2018 2:18:54 PM

LEGEND

- SUBAREA BASIN BOUNDARY
- INITIAL AREA BOUNDARY
- FLOW DIRECTION
- 100.0 — RATIONAL METHOD NODE
- 0.08 — AREA (AC)
- PROPOSED PERVIOUS AREA
- 610 — PROPOSED CONTOUR/SURFACE
- 610 — EXISTING CONTOUR



POC-1

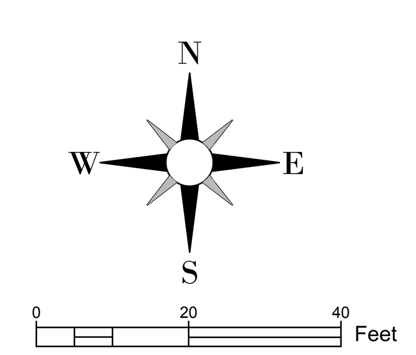
$Q_{100,\ EXISTING}$ = 4.0 CFS

$Q_{100,\ UNDETAINED}$ = 9.4 CFS

$Q_{100,\ DETAINED}$ = 4.0 CFS

A = 1.2 AC

NOTE:
PROPOSED PERVIOUS AREAS AS SHOWN ON THIS EXHIBIT (SEE LEGEND). ALL OTHER AREA WITHIN DRAINAGE BOUNDARIES ASSUMED IMPERVIOUS.



SCALE: 1" = 20'

TORY R. WALKER ENGINEERING
RELIABLE SOLUTIONS IN WATER RESOURCES
122 CIVIC CENTER DR, STE 206, VISTA, CA 92084 · 760-414-9212

RITE AID
PROPOSED CONDITION HYDROLOGY MAP

X:\Projects\2097 (Halferty Development Company)\02 (Rite Aid Valley Center)\04 ACAD\hydrology-map-prop_097-02.dwg, 2/21/2018 9:05:28 PM

FEMA NFHL
PANEL
06073C0810G
eff. 5/16/2012
PROJECT SITE
405-01 (Rite Aid)
Valley Center Rd
S6
Miller Rd
School Bus Ln
Lizard Rocks Rd
Juba Rd
Cole Grade Rd
Indian Creek Rd
REFERENCE LAYERS
NFHL Data Available
FIRM Panel Boundary
LOMR Boundary
SPECIAL FLOOD HAZARD AREAS
1% Annual Chance Flood Hazard
Zone A, AE, A99, AO, AH, AR, V, VE
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee Zone X
NO SCREEN
Areas Outside the 0.2% Annual Chance Floodplain Zone X
Areas of Undetermined Flood Hazard Zone D
CROSS SECTIONS & BFES
Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Base Flood Elevation
SUPPORTING INFORMATION
Limit of Study
Jurisdictional Boundary
Google Earth
©2016 Google
1000 ft
N